WASHINGTON STATE DEPARTMENT OF ECOLOGY

May 1999

AirLines

Car Trek: The Next Generation

Interstate highways: the final frontier. These are the voyages of the average automobile driver. Their daily mission? To beat the rush hour traffic; to hurtle along at speeds in excess of 55 mph; to boldly go where no sport utility vehicle has gone before! Don't worry, you're not caught in a rerun of the old "*Star Trek*" television series. But if you were, you would need to get prepared to move on to an episode of "*The Next Generation.*" Automobile technologies considered far in the future a few years ago are on the verge of becoming reality.

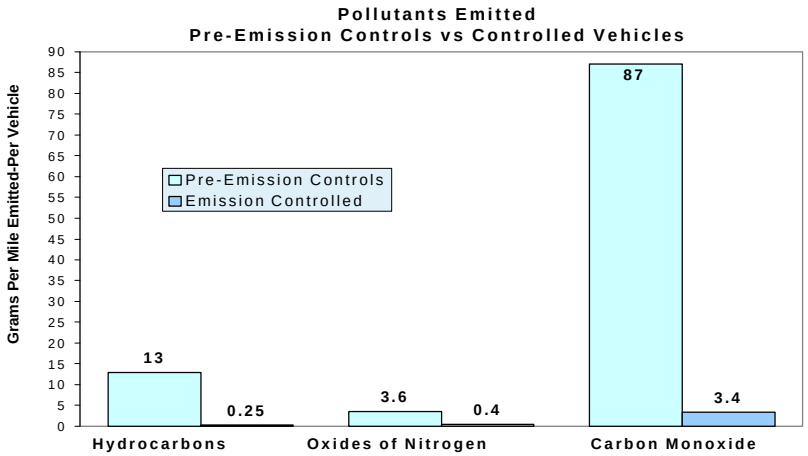
We pay a steep environmental price for the mobility and convenience our cars provide us: motor vehicles cause more than half the air pollution in Washington and one third of the carbon dioxide (a greenhouse gas that causes global warming) emissions in the United States. There are many factors in the relationship between cars and air pollution, including fuel characteristics, engine efficiency, weather conditions, and driving behaviors influenced by transportation systems and the types of communities we live in.

Although technology alone can't resolve all these issues (the weather in particular seems to stubbornly resist all our efforts to control it), the new generation of motor vehicles is expected to be both cleaner and more fuel-efficient than ever before.

Emission Controls

In the 1950s, when smoggy Los Angeles skies were first linked to traffic, typical new cars emitted nearly 13 grams per mile of hydrocarbons, 3.6 grams per mile of nitrogen oxides, and 87 grams per mile of carbon monoxide. Today, federal standards for exhaust emissions from cars are 0.25 gram per mile of hydrocarbons, 0.4 gram per mile of nitrogen oxides, and 3.4 grams per mile of carbon monoxide – a total decrease of about 99.5 grams of pollution per mile, per car.

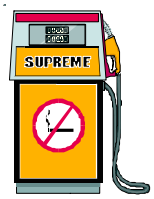
The first major breakthrough in automobile emission control technology was the advent of the catalytic converter in 1975. The ban on leaded gasoline and requirement for lower sulfur content in diesel fuel continued to reduce air pollution. In 1981, most new cars were equipped with sophisticated three-way catalysts (controlling hydrocarbons, nitrogen oxides, and carbon monoxide at the same time) with on-board computers and oxygen sensors. Since then, emission control technology has



continued to be refined. Thanks to technologies such as fuel injection systems and evaporative emission controls, in addition to the catalytic converters and on-board computers, today's cars are about 95 percent cleaner than the cars of 30 years ago. As technology advances, we should continue to see a significant decline in automobile-related air pollution.

Despite this progress in emission control technology, there are still motor vehicle air pollution problems. Each year we see more cars on the road, traveling more miles. Cars have to pollute less per mile just to offset this growth. Fortunately, there are developing technologies with the potential to drastically reduce air pollution.

Clean Fuels



Most of us fill up our cars with gasoline or diesel fuel at the gas station without giving it a second thought – except, perhaps, to bemoan the recently increasing gas prices. But gasoline and diesel aren't the only fuels that can run a motor vehicle. Natural gas, propane, and some kinds of alcohol are capable of powering automobiles. Vehicles that run on these fuels can have up to 90 percent lower emissions of some air pollutants than their conventional gasoline-powered counterparts. A small portion of cars, trucks, and buses in the United States runs on clean fuels as part of pilot projects designed to introduce the vehicles and encourage more research. These vehicles are usually part of private and government fleets.

Natural gas: Natural gas, or methane, is plentiful, costs about the same or slightly less than gasoline, and is easily transported through pipelines. Vehicles fueled with compressed natural gas emit low levels of toxics and ozone-forming hydrocarbons. A disadvantage is that compressed natural gas must be stored under pressure in heavy tanks. The Department of Ecology recently purchased a compressed natural gas vehicle, which is in use at the agency's Northwest Regional Office in Bellevue.

Propane: Propane, or liquefied petroleum gas, is a by-product of petroleum refining and natural gas production. It burns more cleanly than gasoline, but its supplies are limited. It must also be stored in special tanks. Propane-fueled vehicles are already common in many parts of the world.

Ethanol: Ethanol, or grain alcohol, can be produced from corn or other crops and from materials such as wood or paper waste. It has low emissions of hydrocarbons and toxics. Ethanol is currently more expensive than gasoline, but new technologies may reduce the cost. Ethanol/gasoline blends ("gasohol") have been used in the United States for many years.

Methanol: Methanol, or wood alcohol, is similar to ethanol in that it is a high-performance liquid fuel that emits low amounts of toxics and hydrocarbons. It can be produced from natural gas, coal, or wood at prices comparable to gasoline. All of the major auto manufacturers have produced cars that run on a blend of 85 percent methanol and 15 percent gasoline; however, cars that burn pure methanol run more efficiently and offer much greater air quality benefits. methanol has long been the fuel of choice for race cars because of its performance and fire safety characteristics.

Reformulated, oxygenated, and low-sulfur fuels: In some areas, the federal Environmental Protection Agency requires the petroleum industry to market types of gasoline that result in lower emissions than conventional gasoline. These "reformulated" gasolines can be used by existing vehicles without major changes to their engines or fuel distribution systems. Oxygenated gasoline, in which increased oxygen in the fuel makes the combustion process more complete, has been used in some areas to reduce carbon monoxide levels. Low-sulfur diesel fuels can help reduce emissions of particulate matter.

Electric Cars

You may have noticed the recent flurry of media stories about electric and fuel cell cars. Although they are just beginning to be considered a realistic choice, battery-powered vehicles have

actually been around for a long time. About 50,000 electric cars were in use in the United States by 1912.

Driving an electric car is very similar to driving a gasoline or diesel-powered car; but electric cars produce no tailpipe pollution or fuel evaporation. Although electric cars are presently less convenient and more costly than gasoline vehicles, new technical advances show promise in making them more practical for the average driver. There are three basic types of electric vehicles: battery, hybrid, and fuel cell.

Battery: These cars operate solely on the power provided by a battery pack. Drivers can recharge the cars by plugging them into a special electrical outlet. Current batteries for these vehicles are large and expensive, but research into better battery design is underway.

Hybrid: Hybrid vehicles combine two types of power sources in a single vehicle to take advantage of the benefits of both. A hybrid car has batteries to provide electric power, but is also equipped with a small internal combustion engine (usually powered by gasoline). This engine provides a power boost when needed, and recharges the batteries. Although hybrid vehicles produce some pollution when their engines are being used, it is far less than the pollution caused by conventional vehicles.

Fuel cell: A fuel cell car runs on electrical power generated by on-board fuel cells. These cells use a chemical process to convert hydrogen into electricity. Fuel cell cars produce only water vapor, no air pollution. The hydrogen used by the fuel cells can be stored directly (compressed in a tank) or manufactured on-board from a fuel such as methanol. Current research is focused on improving fuel cell size, lowering costs, and developing more efficient, compact, and responsive ways to provide the needed hydrogen.

Auto shop students from Lacey's River Ridge High School, with instructor Bob Simons, pose with their hand-built, battery-operated electric cars. River Ridge students build electric cars every year to learn the technology and participate in area electric car races.

Lifestyles

Even though new cars are about five times cleaner than they once were, driving a car is probably a typical person's most polluting daily activity. Even if you aren't able or willing to buy a car with the latest in air pollution control technology or one that runs on electricity or other clean fuels, there are things you can do to help your car pollute as little as possible.

Avoid unnecessary driving: Plan your trips to consolidate errands. Park where you can do several errands at once. Try to avoid driving during stop-and-go rush hour traffic. Rideshare with a neighbor or co-worker. Walk or bike for short trips.

Drive your car wisely: Remember that anything that improves your gas mileage also reduces air pollution. If it's only mildly warm, turn off your air conditioner and open a window instead. Drive more slowly – reducing your speed by even five miles per hour can help. Go easy on the brakes and avoid "jackrabbit" starts by accelerating gradually.

Maintain your car properly: Have your wheels aligned and keep your tires inflated properly. Get regular engine tune-ups and car maintenance checks. Prevent air conditioning leaks by having your air conditioning system serviced regularly.

When buying a new car: Find one with the best mileage in the class that suits your needs. Reconsider the need for features such as four-wheel drive, which add weight to your car and decrease gas mileage, adding up to more pollution. In addition, keep in mind that sport utility and four-wheel drive vehicles classed as "light-duty trucks" have not been required to meet the same air pollution standards as other cars. EPA has proposed to make light-duty trucks subject to the same standards as cars starting in 2004.

Update

Agricultural Burning: The Agricultural Burning Practices and Research Task Force recently approved new Best Management Practices (BMPs) for agricultural burning. The BMPs were developed with the primary goal of reducing emissions from agricultural burning; but they also assist growers in identifying alternatives to burning and give guidance as to when burning might be allowed. They should prevent unnecessary burning and burning on days when weather conditions won't allow smoke to disperse.

Another significant development in the agricultural burning arena is the signing of an agreement by the Washington Association of Wheat Growers and the Washington State Departments of Ecology and Agriculture. In the agreement, cereal grain growers agree to voluntarily work toward reducing emissions from cereal grain burning by at least 50 percent over the next seven years. *Contact: Karen Wood, (509) 456-5010*

Ozone Season Approaches: Summertime is ozone season. Ozone, the main ingredient of smog, forms when air pollutants (mainly from motor vehicles) react with sunlight on hot days. The Puget Sound and Vancouver areas have been meeting the ozone standard by a very small margin. Residents may be asked to drive less if ozone levels in their area are high. Check with your local air pollution control agency for more information.

Stay in Touch: Keep informed by checking out the Air Quality Program's web site at http://www.wa.gov/ecology/air/airhome.html for the latest air quality news; or visit http://airr.ecy.wa.gov/Public/aqn.html for the most current air monitoring data.

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